ceremonies, such as the rain-making ceremony, the two are mixed up together.

Magical practices are in use among the natives to control the elements, to control vegetable life, to control animal life, and to control human beings. From this it may be inferred how important is the part that magic plays in the daily life of the native. To produce a good harvest, each plant or fruit has a special charm and ceremony. But magic may also be harmful, and is often used to injure an enemy or his property.

Religion, in the Murray Islands, appears to be chiefly represented by one important cult, known as the Bomai-Malu cult. A very strict secrecy is maintained about the ceremonies of this cult, but the

FIG. 2.—A phase of the Ceremonial Dance of the Bomai-Malu *zogo le*. From vol. vi. of the Reports of the Cambridge Expedition to Torres Straits.

authors appear to have succeeded in discovering everything of importance. The origin and nature of the ceremonies, their places and times, the participants, the ritual decoration, and ritual objects are all described at great length. The cult appears to have developed into a secret society or religious fraternity which has taken upon itself disciplinary functions. The cult includes initiation ceremonies for the young men, at which apparently some very good advice is given to the initiate.

There are a large number of valuable illustrations in the volume, including many figures in the text, and some thirty plates at the end. The work is produced in a manner which is highly creditable to the University Press.

THE CALIFORNIAN EARTHQUAKE OF 1906.[1]

WE owe so much to the activity of the institution founded at Washington by the generosity of Mr. Carnegie that it seems ungracious to find any fault, yet we must enter a plaint against the inconvenience of the form of publication which it has adopted. The instalment of the report on the California earthquake of April 18, 1906, now published, consists of two quarto volumes, of more than 450 pages in all, issued in paper covers, accompanied by an atlas which measures two feet in length and more than half a yard in breadth, a size which renders its accommodation in the libraries of most of those who will want to possess and use it a matter of great inconvenience, and necessitates its being stored and kept apart from the volumes which it accompanies. Yet this atlas might easily have been produced in a size that would match the text, for few of the twenty-five maps fill the whole of the sheets on which they are printed, and there are none which might not have been reduced in scale without any loss, and even in some cases with advantage; while those seismograms which could not be reproduced on a page of the same size as the text could have been folded, as is done by the Japanese Earthquake Investigation Committee, without any inconvenience.

Having given vent to this fault-finding we may turn to more congenial topics, and express our admiration of the thoroughness and completeness with which this important earthquake has been investigated and described. After a brief account of the geology of the region, we have a detailed account of that remarkable structural and topographical feature called the San Andreas Rift, which was closely associated with the earthquake. This rift follows a line of faulting, but appears to be the result of a different set of movements from those which produced the great up-and-down throw; for 600 miles, from Humboldt county, on the Pacific coast, to the Colorado Desert, it is marked by a narrow zone of depression, referable either directly to recent deformation of the ground or to erosion controlled by the lines along which this deformation has taken place. Though associated with faulting, often of great throw, as between opposite sides, the rift itself is a narrow strip containing a number of minor faults and fractures, running more or less in the same general direction, and dividing the ground into blocks of unequal size, which have sunk unequally between the margins of the rift. Throughout its length it is marked by steep scarps, generally of small height, ponds, and irregularities in the drainage lines which proclaim it as a region where earth-movement is recent or still in progress; and the greater earthquakes of the district are so commonly accompanied by movement along the rift that it has acquired the local name of "earthquake crack." In 1906 the movement was confined to about 190 miles at the northern end of the rift line, and, as revealed at the surface, appeared in different forms; at times there was but a single fissure, hardly discernible except by its effect in breaking and displacing roads and fences, at others there were several roughly parallel faults, and again, where the rock was covered by surface accumulations or alluvium, there was a series of fissures running obliquely, but arranged in

1 "The California Earthquake of April 18, 1906." Report of the State Earthquake Investigation Commission." By Andrew C. Lawson, Chairman, in collaboration with G. K. Gilbert, H. F. Reid, J. C. Branner, H. W. Fairbanks, H. O. Wood, J. F. Hayford, A. L. Baldwin, F. Omori, A. O. Leuschner, George Davidson, F. E. Matthes, R. Anderson, G. D. Louderback, R. S. Holway, A. S. Eakle, R. Crandall, G. F. Hoffman, G. A. Warring, E. Hughes, F. J. Rogers, A. Baird, and many others. 2 vols. Pp. xviii+451; 146 plates, 66 illustrations in text: atlas of 25 maps and 15 sheets of seismograms. (Washington: Carnegie Institution, 1908.)

echelon, so that the band of fissuring followed the general run of the movement in the underlying rock.

Following on the description of the surface movements along this rift, and the account of the re-triangulation of the country on either side of it, is a detailed description of the distribution of the violence of shock, and discussion of the course of the isoseismals.

FIG. 1.—Characteristic Rift features south-east of Fort Ross. Fault trace in foreground.

These have a peculiar distribution; the maximum violence was along a narrow band closely adjacent to the rift line, where surface displacements were greatest, but the progressive diminution of violence, as this line is left, is interrupted by a number of isolated areas of destructive violence. In discussing the explanation of these isolated centres of increased violence, the conclusion is reached that they are due to variations in the nature of the ground, and to be attributed to the well-known fact, illustrated by some interesting experiments contained in the report, that earthquakes are commonly more destructive on alluvium or made ground than on rock; but in attempting to ascribe all the irregularities in the course of the isoseismals to this cause, we *cannot but feel that the committee*, or, rather, its chairman, has given its support to an obsolescent theory. So many instances are now known of extended origins, and of earthquakes with more than one centre of maximum violence, that an attempt to refer an earthquake to a single centre of origin is no longer justifiable unless this hypothesis is easily reconcilable with observation. In this case it seems more reasonable to accept the isolated centres of destruction, or of increased violence, as independent centres of origin of the same great earthquake, not of separate local earthquakes, as suggested and controverted in the report.

The experiments, to which reference has been made, are of great interest, and throw light on some little understood earthquake phenomena. They were made with a shaking table, set in motion by a crank and connecting-rod, of the same type as that employed in the Japanese experiments on the overturn of columns; the table carried a box which was filled with sand or gravel, dry, or mixed with different proportions of water, and determinations were made of the amplitude and character of movement of the surface of the sand as compared with that of the table. With closely packed dry sand there was little difference, but with wet sand the amplitude was greater, and, what is more important, the reversal of motion much more abrupt, giving an acceleration which, in one experiment, was more than three times as great as that of the table. We have here a suggestion of the reason for this fact, which has often been observed, that the destructive effect of an earthquake is greater on alluvium near its junction with rock than on the rocks or further out on the alluvium, and it is to be hoped that this very interesting and suggestive line of experiment may be followed up more fully than was possible in time for the publication of the report.

Only a few of the more striking features of this report have been referred to; it would be impossible to deal in detail with the discussion on scales of intensity, the direction of vibratory movement, the effect of the shock on men and animals, and the many other matters described with a prolixity of detail, and "exprest" in a language which, with thankfulness be it said, has not yet become "thrly" unintelligible to the average Englishman.

FIG. 2.—Ponds along Rift near San Benito.